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ABSTRACT

This study used survival analysis (also called event history analysis) to investigate how long specially admitted students at Northern Illinois University persist, in which year of their education they are most likely to leave, and if the risk of leaving school is affected by personal and academic background characteristics. Specially admitted students are otherwise capable students, often from racial minorities or other underrepresented groups, whose pre-college preparation does not meet the institution's normal requirements. Before and after admission, these students are provided with a wide range of special counseling, tutoring, mentoring, and transition services. Subjects were a total of 1,639 specially admitted students admitted in 1986 through 1989. For these students data on gender, ethnicity, achievement sub-test and composite scores, high school rank, cumulative credit hours, grade point average, academic status for each semester, and graduation date were analyzed. Findings revealed that the highest risk period of leaving school happened in the second, third, and fourth semesters for both genders, for almost all four ethnic groups, and for groups differing in college admissions test scores or high school rank. In addition, after the median survival time, the distribution of survival is stable but indicates a slightly decreasing trend for about four semesters. The risk rate then increases again in the very late semesters (such as the 11th to 13th semesters). (Contains 7 tables, 6 figures and 10 references.) (JB)

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A Discrete-Time Survival Analysis of the Education Path of Specially Admitted Students

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Paper presented at the the American Educational Research Association Annual Meeting

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ABSTRACT

This study uses survival analysis (also called event history analysis) to investigate how long specially admitted students persist, in which year of their education they are most likely to leave, and if the risk of leaving school differ by personal and academic background characteristics. The findings revealed that (1) the highest risk period of leaving school happened in the second, third, and fourth semesters for both gender groups, for almost all four ethnic groups, and for the ACT and High School Rank groups. (2) After the median survival time, the distribution of survival is stable but indicates a slightly decreasing trend for about 4 semesters. The risk rate then increases when the curves approach the 11th and later semesters.

A Discrete-Time Survival Analysis of the Education Path of Specially Admitted Students

I. Objectives and Theoretical Framework

The office of Educational Services and Programs (ESP) of Northern Illinois University has the mission of identifying, recruiting, preparing, and assisting otherwise capable students whose pre-college education has not fully enabled them to take maximum advantage of their potential and the opportunities of higher education. Operating at both the pre-college and college levels, ESP serves a diverse student population; however, racial minorities and others historically underrepresented in higher education are especially sought. In the period covered in this study, ESP has annually served in excess of 700 students in its pre-college division and approximately 2,000 students in the college-level division, including 450 to 500 first-year admissions. ESP administers state, institutional, federal, and local funds which support comprehensive services including alternate university admissions for first-year and pre-sophomore transfer students, personal and group counseling, financial aid counseling, academic and career advising and placement services, personal and skills development activities and seminars, tailored instruction and formal development classes, individual and group tutoring, mentoring, and transition preparation.

All of the counseling and academic support services provided through ESP's various offices and its formal programs, such as Peer Assistance Learning (tutoring), Supplemental Instruction, and the Student Support Services Program are open to all ESP-admitted students. The counselors employ an energetic and intrusive intervention style, and particularly work closely with the first-year students. Although the counselors continue to monitor and serve their assigned students throughout their undergraduate career, as the students gain in confidence and independence following their first year, the students seek out the counselors less frequently and likewise student follow-up by the counselors becomes less intense.

The primary purpose of the research conducted in ESP is to develop a more effective student admissions and service delivery system and thereby increase the rates of student persistence and graduation. Yet there are several very specific needs driving the ongoing

research and assessment efforts. Initially data are collected to determine if there is a reasonably well defined profile of the type of student who enrolls and graduates. What needs do the incoming students exhibit and are those needs changing over time? The process of assessing student needs likewise requires a constant tinkering with the service delivery system because there is actually no single student profile that can be generally used to define either the students who persist through to graduation versus those who do not.

Traditional Measures for ESP Admits' Education Paths

(1) *Graduation Rate and Time-to-Graduation*

As is in most colleges and universities, success at Northern Illinois University (NIU) has been traditionally defined and measured by the student graduation rate and the time-to-graduation period. NIU concentrates on the four and five-year graduation rates, although studies are continued through the six-year period, which is the upper limit set and measured throughout the state's universities by the Illinois Board of Higher Education. Table 1 depicts the graduation frequencies and rates for the ESP-admitted classes of 1986, 1987, 1988, and 1989. As illustrated by this table, the time-to-graduation periods for ESP admits are longer (typically 10 to 12 semesters versus the traditional 8 to 10 semesters), and the graduation rates are lower than for NIU's traditionally-admitted students (averaging 27% versus the traditionally-admitted rate of 54%). Actually, these data should not be at all surprising when one takes into account the characteristics of and the criteria by which the ESP admits are selected, as well as the requirements of students in their first year. ESP-admitted students are considered academically underprepared and they generally do not meet one or more of the traditional admissions criteria required by the NIU Office of Admissions. Further, once enrolled, the vast majority of ESP admits must take prescribed developmental and preparation courses during their first year before they can begin to satisfy the NIU core requirements, which extends their enrollment and hence their time-to-graduation.

Insert Table 1 here

Yet it must be pointed out that the student graduation rate and the time-to-graduation period data barely begin to illustrate certain critical information about the students who have

eventually graduated. These measures omit important information about the students who never graduated but who struggled for varying periods at NIU and thereby benefited from the education they received or the students who left NIU in Good Academic Standing (GPA≥2.0).

(2) *Enrollment*

Enrollment is another commonly used indicator for college success. However, it only captures information about the number of students of an admit group enrolled in a specific semester and does not necessarily represent a comparison with the previous enrollments. Therefore, enrollment does not accurately measure student persistence, because some students may exit and return to school several times during the course of their studies. Also, the drop-out rate that is simply calculated from an enrollment for a specific semester can be misleading. For example, a student who left school more than once could be counted as a drop-out more than once. At the same time, this student's re-enrollment could reduce the real drop-out rate at least for the semester of his return.

In an effort to learn more about the persistence of ESP admits, we have constantly asked ourselves questions such as: can we determine and define more accurately what kinds of students persist, how long they persist, and to what degree do they achieve during their enrollment? Subsequently, we decided to conduct this study to address the following questions:

* How many years do special admitted students persist and in which year or semester of their education are they most likely to leave?

* Does the risk of leaving school differ according to personal and academic background characteristics such as: gender, ethnicity, the ACT composite score, or High School Percentile Rank?

II. Methods

Sample

The subjects that were used in this study are the ESP classes admitted in 1986, 1987, 1988, and 1989. The total number of subjects is 1,639. The data sets for the four admit groups were collected periodically from the students' admission semester up to the Fall semester of 1995. This study only analyzed Fall and Spring semester data and did not look at

the summer semesters because that enrollment was too small. Specifically, the data reported for each of the ESP classes are as follows: for 1986 the admits have 8.5 years (17 semesters); for 1987 it is 7.5 years (15 semesters); for 1988 it is 6.5 years (13 semesters); and for 1989 it is 5.5 years (11 semesters). The data sets include students' gender, ethnicity, ACT sub-test and composite scores, High School Percentile Ranks, cumulative credit hours, GPA, academic status for each semester, and graduation date.

The groups consisting of Native American and "Other" were not included in the statistical comparisons in this study, because the sample sizes for those groups was too small. Table 2 presents the information for: gender, ethnicity, and ranges of ACT composite scores and High School Ranks for these four groups. Generally, the table indicates that typically the females outnumber the males and the group of Blacks is larger than each of the other ethnic groups. The ACT composite scores range from single digits up to the 20's, with the mean in the teens. The High School Percentile Ranks have an even broader range, that is, from the single digits to the 99th percentile. The means of the High School Percentile Ranks are in 50's.

Insert Table 2 here

Students, who graduated or left NIU with a GPA≥2.0 or who were still enrolled in the Spring of 1995 were coded as censored. For the students, who left NIU and returned, the time interval(s) of absence were still coded as being in school, because most of the students returned with transferred credit hours. Therefore, the "event" for the survival analysis in this study, is leaving school due to academic failure.

A previous study that analyzed ESP 1985 admits at NIU (House, 1990) indicated that ESP students with ACT composite scores below 11 had a significantly lower fourth semester persistence rate than the persistence rate for the students with an ACT composite above 11. The subjects of this study were classified into two groups using the ACT composite score of 11 as the cut-off, that is, "ACT < 11" and "ACT≥11". Since a High School Percentile Rank of 50 or higher has been part of the traditional admission criteria for NIU, the students were also classified into two groups using a cut-off score of 50 for the High School Percentile Rank. The High School Rank groups were indicated as "HSR < 50" and "HSR≥50".

Statistical Analysis

Survival analysis (also called event history analysis) is a statistical technique for studying duration and the timing of events (Allison, 1984, Yamaguchi, 1991). Singer and Willett (1992, 1993, 1995) introduced discrete-time survival analysis to educational researchers to address questions such as whether, and, if so, when events occur. Researchers have been using this technique to investigate, with longitudinal data, the association between grade retention and dropout in high school (Roderick, 1994), teachers' career paths (Singer, 1992, Shin, 1994), and degree attainment (Braun & Zwick, 1993), etc.

An important concept of survival analysis is the hazard rate --- a conditional probability that a randomly selected student leaves school in any particular semester given that he/she stayed continuously until that semester. A key feature of survival analysis is that it includes both groups of students who leave school and who persist in school. Hazard rate is computed using each semester risk set which consists of those students known to leave school in that semester (Singer & Willett, 1993). Survival probability for the whole group involved in the study is simply 1 minus the hazard probability. The estimated median lifetime or survival time indicates the amount of time that passes until half the sample left. It can be interpreted as the magnitude of persistent time (in semesters) an average student has.

Discrete-time survival analysis was conducted using PROC CATMOD in SAS. Five discrete-time hazard models were generated using four different covariates --- gender, race, ACT group, and High School Rank group separately, to detect the overall likelihood of leaving school due to academic failure as well as the effects of ESP students' personal characteristics and academic background on their persistence in school.

Model A: $\text{logit}_e(h_{ij}) = [\alpha_1 D_{1ij} + \alpha_2 D_{2ij} + \ldots + \alpha_k D_{kij}]$

Model B: $\text{logit}_e(h_{ij}) = [\alpha_1 D_{1ij} + \alpha_2 D_{2ij} + \ldots + \alpha_k D_{kij}] + \beta_1 (\text{GENDER})_{ij}$

Model C: $\text{logit}_e(h_{ij}) = [\alpha_1 D_{1ij} + \alpha_2 D_{2ij} + \ldots + \alpha_k D_{kij}] + \beta_1 (\text{ETHNIC})_{ij}$

Model D: $\text{logit}_e(h_{ij}) = [\alpha_1 D_{1ij} + \alpha_2 D_{2ij} + \ldots + \alpha_k D_{kij}] + \beta_1 (\text{ACT})_{ij}$

Model E: $\text{logit}_e(h_{ij}) = [\alpha_1 D_{1ij} + \alpha_2 D_{2ij} + \ldots + \alpha_k D_{kij}] + \beta_1 (\text{HSR})_{ij}$

Where D_s are a sequence of dummy variables indexing time periods. The j refers to the last time period observed for anyone in the sample. The k is the total semester's collected data and α_s and β_1 are the parameters. The models were set up using all available timing

parameters. For example, the models for the 1986 ESP admits have D_1 (the first semester) and up to D_{17} (17th semester). The parameters were not included in the models if they were not converged in the preliminary runs. In other words, the goodness-of-fit tests were based on the converged parameters.

The risk rate is calculated according to the following formula:

$$h_{ij} = \frac{1}{1 + e^{-[(\alpha_1 D_{1ij} + \alpha_2 D_{2ij} + \cdots + \alpha_J D_{Jij}) + (\beta_1 Z_{1ij} + \beta_2 Z_{2ij} + \cdots + \beta_p Z_{pij})]}}$$

and the survival probability is estimated using the following formula:

$$\hat{S}_j = \prod_{k=1}^{j} (1-\hat{h}_k) .$$

Model A explored the relationship between hazard and the semester-time indicators, which serves as the baseline for comparisons. Model B, C, D, and E are different from Model A because one covariate/predictor was added into their equations. The goodness-of-fit between baseline Model A and Models B, C, D, or E, test the main effect of gender, ethnicity, ACT group, and High School Rank group. The change in the statistics, -2LL (Log Likelihood) of the baseline Model A and Models B, C, D, or E and the corresponding *p* value, indicate if a significant difference exits between the two models. The significant difference shall be due to the contribution of the additional covariate in the second model. For example, the significant difference between Models A and B is due to the main effect of gender.

III. **Results and Conclusions**

(1) *How Long do ESP Admits Persist in School ? When are the Biggest Risk Periods?*

Figure 1 plots the hazard probability for the 1986 to 1989 admit groups. A consistent trend can be seen in the Figure that the second, third, and fourth semesters of their education represents the highest risk periods to leave school. The high risk rate also occurs in the later semesters such as in the 11th or later semester. Figure 2 plots the corresponding survival

probability. The median "lifetime" persistence, which was determined by the corresponding survival probability of 0.5, is 5.3, 5.5, 5.2, 5.8 semester for ESP 1986, 1987, 1988, and 1989 admits respectively. After the median survival time, the distribution of survival is stable but indicates a slightly decreasing trend for about 4 semesters. The risk rate then increases when the curves approaches the 11th and later semesters.

Insert Figure 1 and 2 here

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(2) *Does a Student's Gender, Ethnicity, or Academic Background Make a Difference?*

Table 3 summarizes the median "lifetime" persistence for the ESP admits of 1986, 1987, 1988, and 1989 and the average of the median "lifetime" over the four years of admit groups. The median "lifetime" persistence is higher for females than males, higher for the "ACT$\geq$11" group than for the "ACT$<$11" group, and higher for the "HSR$\geq$50" group than for the "HSR$<$50" group for all four years of admit groups. The median "lifetime" persistence for the Black group is lower than for the other three ethnic groups for the 1986, 1987, and 1989 admits. The Hispanic group has an even lower median "lifetime" persistence than Blacks for the ESP 1988 admits although the Hispanic group has quit high median "lifetime" for ESP 1986 admits and highest median "lifetime" for ESP 1989 admits. The Asian group has a higher median "lifetime" persistence than the other three ethnic groups for the 1986, 1987, and 1988 admits but not for the 1989 admits.

On average, the females stay in school about 7.5 semesters, whereas males stay in school 4.1 semesters. The Asian students stay in school about 11.5 semesters, for Whites it is 10.1 semesters, for Hispanics it is 8 semesters, and for Blacks it is only 3.7 semesters. Students with an ACT composite below 11 stay in school about 3.3 semesters whereas the students with an ACT composite 11 or above stay in school about 7.9 semesters. Students with a High School Rank less than 50 stay in school about 4.1 semesters and students with a High School Rank of 50 or above stay in school about 9.9 semesters.

Insert Tables 3 here

Tables 4, 5, 6, and 7 present the parameters, standard errors, and the goodness-of-fit statistics for the four hazard models for ESP 1986 - 89 admits. The p values are all less than .05 for the comparisons between Model A and Models B, C, D, or E across all four ESP admit groups. The results indicate that there are statistically significant main effects of gender, ethnicity, ACT groups, and High School Rank groups on the hazard rate of leaving school due to the academic failure. Combining the results in Table 3, we can summarize that ESP males have a significantly greater risk of leaving school than the females, the "ACT $<$ 11" group has a significantly greater risk of leaving school than the "ACT $\geq$ 11" group, and the "HSR $<$ 50" group has a significantly greater risk of leaving school than the "HSR $\geq$ 50" group. Since four ethnic groups are involved in the comparison, three contrasts, (1) Blacks vs Whites; (2) Blacks vs Hispanic; (3) White vs Asian were performed for further comparisons among the ethnic groups after a significant ethinicity main effect was detected.

Insert Tables 4, 5, 6, and 7 here

Figures 3, 4, 5, and 6 plot the hazard probability for gender, ethnic group, ACT, and High School Rank groups across ESP 1986, 1987, 1988, 1989 admits. It can be seen from Figure 3, that the biggest risk of leaving school happened in the second, third, and fourth semesters for both gender groups. For example, in the 1986 admit group, 21% of the males and 17% of the females leave school by the end of their second semester; and among those who continue after this point, 22% of the males and 18% of the females leave by the end of their third semester. Among those who survived three semesters, 13% of the males and 14% of the females leave by the end of their fourth semester.

Insert Figures 3, 4, 5, and 6 here

It can be seen in Figure 4 that Black students consistently have the highest risk of leaving school during their second, third, and fourth semesters. Other ethnic groups have slightly different trends in the risk of leaving school during their second semester to fourth

semesters. For example, in the ESP 1987 admit group, 19%, 21% and 20% of the Blacks leave in their second, third, and fourth semesters; whereas it is 13%, 12% and 6% for Whites; 21%, 14%, and 19% for Hispanics; and 7%, 10%, and 8% of the Asians leave in their second, third, and fourth semesters.

It can be seen from Figure 5, that the highest risk of leaving school occurred in the second, third, and fourth semesters consistently for both ACT groups for all of the 1986 - 89 admits. For example, 24% of the "ACT≤11" group and 17% of the "ACT>11" group of the 1988 admits leave by the end of their second semester. Among those who continue after this point, 32% of the "ACT≤11" group and 16% of the "ACT>11" group leave by the end of their third semester. Among those who survived three semesters, 16% of the "ACT≤11" group and 14% of the "ACT>11" group of the 1988 admits leave by the end of their fourth semester. Students with ACT composite scores of 11 or above, have a significantly higher persistence rate than students with ACT composite scores below 11. However, some of the ESP students with ACT composite scores below 11 did persist as long as and even graduated with the students with higher ACT composite scores.

It can be seen from Figure 6, that the highest risk of leaving school happened in the second, third, and fourth semesters consistently for both High School Rank groups for all the 1986 - 89 admits. Also, the first semester is a high risk period for the "HSR<50" group for ESP 1989 admits. For example, 11% of the "HSR<50" group and 3% of the "HSR≥50" group in the ESP 1989 admits leave school by the end of their first semester. Among those who succeeded in the first semester, 19% of the "HSR<50" group and 14% of the "HSR≥50" group of ESP 1989 admits leave by the end of their second semester. Among those who continue after this point, 21% of the "HSR<50" group and 17% of the "HSR≥50" group leave by the end of their third semester. Among those who survived three semesters, 13% of the "HSR<50" group and 12% of the "HSR≥50" group of ESP 1988 admits leave by the end of their fourth semester. Similar to the ACT groups, students with a High School Percentile Rank of 50 or above have a significantly higher persistence rate than the students with High School Percentile Rank less than 50. However, some of ESP students with a High School Percentile Rank of less than 50 did persist as long as and even graduated with the students

with a higher High School Percentile Rank.

It also can be seen from Figures 3, 4, 5, and 6 that the hazard rates increase in the later semesters for all gender, ethnic, ACT, and High School Rank groups for all four admit groups.

In summary, the highest risk period of leaving school happened in the second, third, and fourth semesters for both gender groups, almost all four ethnic groups, and the ACT and HSR groups for ESP 1986 to 1989 admits. The high risk periods also occurred in the very late semesters such as 11th to 13th semesters.

IV. Educational Implications of the Study

First-year students normally experience some degree of "transition shock" upon matriculation in college, particularly at a large public institution such as Northern Illinois University. The NIU recruitment area is heavily populated with potential first-year students who would be the first of their families to complete a baccalaureate degree and it is estimated that nearly 60% of each entering class of first-year students at NIU classify themselves as "first generation" college students. The ESP-admitted student presents yet more of challenge to efforts for retention and graduation. As evidenced above in the presented data, the ESP-admitted student has a profile of being educationally underprepared for general success at NIU. Nearly 90% of the ESP-admitted students are from minority groups, and as expected, the ESP-admitted student is even more likely than a traditionally admitted student to be a "first-generation" student. Clearly, one can readily understand that for students so defined the hazard rate for the first few semesters is likely to be high.

The interventions provided by ESP personnel, coupled with the cooperating services provided by other university departments, are provided to students throughout their enrollment, but they are purposefully most intense during the first two semesters. However, it has become increasingly evident that interventions of a similar nature are yet required into the third and fourth semesters, particularly for specified groups. The data would also suggest that adjustments in the early intervention strategies should also be considered as a means of having a more long term impact. For example, despite students' tendency to avoid using ESP

services after their first year, they would likely benefit from a continuing intrusion by ESP personnel to encourage them to use ESP services well beyond the first three to four semesters.

Beyond the need to provide extended services to assist students in adapting to the rigors of the academic experience and the culture of the university community, the study also indicates a need to address the apparent crisis that occurs for a selected group of students who persist for four or more years and yet leave prior to graduation. There is a small group of students which is lost even after 11 or more semesters. It is not yet clear if their leaving is the manifestation of some festering needs that were not met early in their undergraduate career or if some new phenomena have occurred which ESP has not detected. The data do not indicate that there are any real commonalities among these students and some further investigation will be needed. However, it is clear that although this group is a small one, any losses at such a late stage are quite significant when the reasons for the losses are not attributable to personal difficulties, health complications, or other circumstances beyond the control of ESP and NIU.

Of all the groups it is obvious that it is the ESP African American males who have consistently experienced the lowest rate of success and the highest dropout rate in every period and in virtually every area measured. Singularly, this group of students requires not only the most intense and sustained intervention, but perhaps services which are uniquely tailored for their needs. An African American male mentoring group which has been initiated on a small scale has begun to show signs of positively impacting the persistence rate of its participants. The expansion of such services, together with more individualized counseling and one-on-one interventions, is currently being explored. Further, ESP has also undertaken efforts to expand its early outreach efforts to males in the lower grades in high school as well as the eighth grade.

There is no single services delivery system or set of interventions which will guarantee success in the recruitment, retention and graduation of specially-admitted students. The effort requires careful and ongoing assessment, broad institutional intervention and support, and regular review and revision.

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Table 1. Graduation up to December 1994 (ESP 1986-1989)

Admit Year	Graduation after Semester											Total Graduates	Initial Admits	Grad. Rate
	7	8	9	10	11	12	13	14	15	16	17			
1986	1	19	25	39	13	13	4	4	1	2		121	364	33.2%
1987		17	27	30	10	11	3	2				100	374	26.7%
1988		23	27	41	12	13	3					119	446	26.7%
1989		22	26	44	11							103	455	22.6%

Table 2. Personal and Academic Background (ESP 1986-1989)

Admit Year	Gender		Ethnicity				ACT		HSR	
	Male	Female	Black	White	Hispanic	Asian	Mean	Range	Mean	Range
1986	123	240	212	74	40	37	13.77	6-25	52.88	8-99
1987	133	239	208	78	43	43	13.37	5-23	55.65	4-99
1988	169	268	259	53	60	64	13.86	5-26	54.38	5-99
1989	184	271	290	61	49	53	13.58	5-27	53.30	1-99

Table 3. Median "Lifetime" Persistence in School (ESP 1986-1989)

Admit Year	Gender		Ethnicity				ACT Group		HSR Group	
	Male	Female	Black	White	Hispanic	Asian	ACT<11	ACT≥11	HSR<50	HSR≥50
1986	4.1	6.7	3.7	10.2	12.7	13.3	3.3	7.2	4.0	13.1
1987	3.5	9.6	3.1	11.1	5.0	14.0*	3.8	7.4	4.2	9.3
1988	5.2	5.3	4.2	8.4	3.4	10.0	3.0	8.3	4.2	8.3
1989	3.7	8.3	3.8	10.6	11.0	8.8	3.1	8.5	3.9	9.0
Mean	**4.1**	**7.5**	**3.7**	**10.1**	**8.0**	**11.5**	**3.3**	**7.9**	**4.1**	**9.9**

* The estimation is not accurate because the survival probability exceeds 0.5 over all semesters.

TABLE 4
Parameter estimates, standard errors, and goodness-of-fit statiscs for four hazard models fitted to the ESP 1986 admits: (A) the main effect of the time indicators; (B) the main effects of the time indicators and time-invariant gender; (C) the main effects of the time indicators and time-invariate ethinicity; (D) the main effects of the time indicators and time-invariate ACT groups; and (E) the main effects of the time indicators and time-invariate High School Rank groups.

	Model A	Model B	Model C	Model D	Model E
Effect	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)
D01	-3.22(0.27)	-3.17(0.27)	-3.40(0.28)	-3.11(0.27)	-3.31(0.30)
D02	-1.48(0.14)	-1.44(0.14)	-1.65(0.15)	-1.39(0.14)	-1.84(0.16)
D03	-1..43(0.15)	-1.38(0.15)	-1.58(0.17)	-1.31(0.16)	-1.45(0.16)
D04	-1.83(0.20)	-1.78(0.20)	-1.98(0.21)	-1.71(0.20)	-1.92(0.21)
D05	-2.71(0.31)	-2.67(0.31)	-2.86(0.32)	-2.58(0.31)	-2.68(0.31)
D06	-2.60(0.31)	-2.55(0.31)	-2.75(0.32)	-2.47(0.32)	-2.56(0.31)
D07	-3.86(0.58)	-3.81(0.58)	-4.00(0.59)	-3.74(0.58)	-3.82(0.58)
D08	-3.81(0.58)	-3.76(0.58)	-3.95(0.59)	-3.68(0.59)	-3.77(0.58)
D09	-3.67(0.58)	-3.62(0.59)	-3.82(0.59)	-3.54(0.59)	-3.64(0.59)
D10	-4.52(1.01)	-4.48(1.01)	-4.68(1.01)	-4.42(1.01)	-4.51(1.01)
D11	-2.56(0.52)	-2.52(0.52)	-2.71(0.52)	-2.48(0.52)	-2.57(0.52)
D13	-2.71(1.03)	-2.76(1.03)	-2.81(1.04)	-2.67(1.03)	-2.63(1.04)
D14	-0.98(0.68)	-1.00(0.68)	-1.10(0.68)	0.89(0.68)	-0.92(0.68)
GENDER		-0.16(0.08)			
RACE			-0.16(0.12)		
RACE			-0.32(0.12)		
RACE			0.19(0.19)		
ACT				0.23(0.08)	
HSR					0.30(0.08)
-2LL	1261.93	1257.5	1254.03	1248.84	1131.65
Change in -2LL		4.43	7.9	13.09	130.28
p		< .05	< .05	<.001	<.001

TABLE 5
Parameter estimates, standard errors, and goodness-of-fit statiscs for four hazard models fitted to the ESP 1987 admits: (A) the main effect of the time indicators; (B) the main effects of the time indicators and time-invariant gender; (C) the main effects of the time indicators and time-invariate ethinicity; (D) the main effects of the time indicators and time-invariate ACT groups; and (E) the main effects of the time indicators and time-invariate High School Rank groups.

	Model A	Model B	Model C	Model D	Model E
Effect	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)
D01	-2.55(0.20)	0.20(0.63)	0.16(0.63)	0.19(0.63)	0.46(0.75)
D02	-1.65(0.15)	1.11(0.62)	1.08(0.62)	1.05(0.62)	1.36(0.74)
D03	-1.59(0.16)	1.17(0.62)	1.14(0.62)	1.15(0.62)	1.36(0.74)
D04	-1.76(0.19)	1.01(0.63)	0.99(0.63)	0.95(0.63)	1.16(0.75)
D05	-3.00(0.36)	-0.24(0.70)	-0.24(0.70)	-0.26(0.70)	-0.09(0.82)
D06	-2.43(0.29)	0.33(0.66)	0.34(0.66)	0.32(0.66)	0.54(0.79)
D07	-3.27(0.46)	-0.53(0.75)	-0.52(0.75)	-0.53(0.75)	-0.24(0.86)
D08	-3.23(0.46)	-0.48(0.75)	-0.48(0.75)	-0.48(0.75)	-0.19(0.86)
D09	-3.96(0.71)	-1.22(0.93)	-1.21(0.93)	-1.21(0.93)	-0.92(1.12)
D10	-3.18(0.59)	-0.45(0.84)	-0.45(0.84)	-0.42(0.84)	-0.14(0.93)
D12	-3.18(1.02)	-0.47(1.18)	-0.53(1.18)	-0.45(1.18)	0.01(1.26)
D13	-2.48(1.04)	0.11(1.20)	0.22(1.20)	0.27(1.20)	-0.96(1.28)
D15	-1.10(1.15)	-2.70(0.60)	-2.88(0.60)	-2.66(0.60)	-2.30(0.72)
GENDER		0.22(0.08)			
			0.34(0.12)		
RACE			-0.14(0.16)		
RACE			0.16(0.19)		
ACT				0.20(0.08)	
HSR					0.21(0.08)
-2LL	1279.2	1225.13	1222.41	1216.11	1143.81
Change in -2LL		54.07	56.79	63.09	135.39
p		< .001	<.001	<.001	<.001

TABLE 6

Parameter estimates, standard errors, and goodness-of-fit statiscs for four hazard models fitted to the ESP 1988 admits: (A) the main effect of the time indicators; (B) the main effects of the time indicators and time-invariant gender; (C) the main effects of the time indicators and time-invariate ethinicity; (D) the main effects of the time indicators and time-invariate ACT groups; and (E) the main effects of the time indicators and time-invariate High School Rank groups.

	Model A	Model B	Model C	Model D	Model E
Effect	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)
D01	-2.81(0.21)	-2.83(0.21)	-2.97(0.22)	-2.84(0.22)	-2.86(0.21)
D02	-1.48(0.13)	-1.45(0.12)	-1.53(0.14)	-1.38(0.13)	-1.48(0.13)
D03	-1.42(0.14)	-1.39(0.14)	-1.47(0.15)	-1.32(0.15)	-1.41(0.14)
D04	-1.81(0.18)	-1.78(0.18)	-1.86(0.19)	-1.68(0.19)	-1.76(0.18)
D05	-3.18(0.36)	-3.15(0.36)	-3.23(0.37)	-3.19(0.39)	-3.29(0.39)
D06	-2.88(0.32)	-2.85(0.32)	-2.93(0.33)	-2.76(0.33)	-2.96(0.34)
D07	-4.03(0.58)	-3.99(0.58)	-4.07(0.59)	-3.89(0.58)	-3.99(0.58)
D08	-3.71(0.51)	-3.67(0.50)	-3.76(0.51)	-3.57(0.51)	-3.67(0.51)
D09	-3.04(0.42)	-3.01(0.42)	-3.08(0.42)	-2.91(0.42)	-3.20(0.45)
D10	-2.07(0.32)	-2.02(0.32)	-2.08(0.33)	-1.92(0.32)	-2.02(0.32)
D11	-2.44(0.52)	-2.69(0.60)	-2.77(0.60)	-2.58(0.60)	-2.35(0.52)
D12	-2.67(0.73)	-2.65(0.73)	-2.71(0.74)	-2.58(0.73)	-2.56(0.73)
D13	-0.51(0.73)	-0.31(0.76)	-0.21(0.78)	-0.47(0.73)	-0.85(0.83)
GENDER		0.06(0.07)			
RACE			0.16(0.11)		
RACE			-0.02(0.17)		
RACE			0.26(0.16)		
ACT				0.19(0.08)	
HSR					0.17(0.07)
-2LL	1490.27	1469.43	1456.06	1438.74	1420.77
Change in -2LL		20.84	34.21	51.53	69.5
p		< .001	< .001	< .001	< .001

TABLE 7

Parameter estimates, standard errors, and goodness-of-fit statiscs for four hazard models fitted to the ESP 1989 admits: (A) the main effect of the time indicators; (B) the main effects of the time indicators and time-invariant gender; (C) the main effects of the time indicators and time-invariate ethinicity; (D) the main effects of the time indicators and time-invariate ACT groups; and (E) the main effects of the time indicators and time-invariate High School Rank groups.

	Model A	Model B	Model C	Model D	Model E
Effect	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)	Parameter estimate(SE)
D01	-2.65(0.19)	-2.63(0.19)	-2.93(0.21)	-2.55(0.19)	-2.66(0.20)
D02	-1.54(0.13)	-1.52(0.13)	-1.81(0.15)	-1.45(0.13)	-1.61(0.14)
D03	-1.42(0.14)	-1.39(0.14)	-1.67(0.16)	-1.31(0.14)	-1.45(0.14)
D04	-1.97(0.19)	-1.93(0.19)	-2.20(0.20)	-1.84(0.19)	-1.95(0.19)
D05	-2.95(0.31)	-2.91(0.31)	-3.18(0.32)	-2.82(0.31)	-3.10(0.34)
D06	-3.07(0.34)	-3.04(0.34)	-3.29(0.35)	-2.94(0.34)	-3.15(0.36)
D07	-3.38(0.42)	-3.35(0.42)	-3.59(0.42)	-3.25(0.42)	-3.35(0.42)
D08	-4.04(0.58)	-4.00(0.58)	-4.25(0.59)	-3.90(0.58)	-4.01(0.58)
D09	-2.96(0.39)	-2.94(0.39)	-3.18(3.39)	-2.83(0.39)	-2.93(0.39)
D10	-3.88(0.71)	-3.87(0.71)	-4.11(0.72)	-3.77(0.72)	-3.85(0.71)
D11	-1.98(0.53)	-1.20(0.53)	-0.24(0.54)	-1.92(0.54)	-1.96(0.54)
GENDER		0.17(0.07)			
RACE			0.44(0.12)		
RACE			0.06(0.17)		
RACE			-0.48(0.21)		
ACT				0.24(0.07)	
HSR					0.17(0.07)
-2LL	1491.71	1485.79	1471.18	1472.88	1390.01
Change in -2LL		5.92	20.53	18.83	101.7
p		< .025	< .001	< .001	< .001

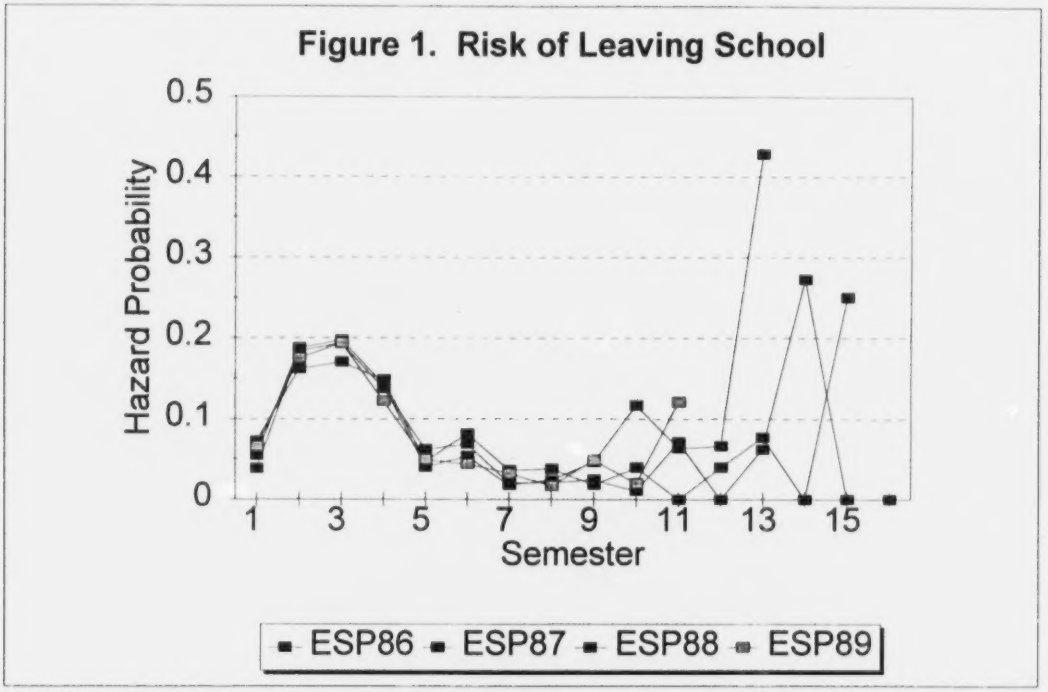
Figure 1. Risk of Leaving School
Hazard Probability
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0.4
0.3
0.2
0.1
0
1
3
5
7
9
11
13
15
Semester
ESP86
ESP87
ESP88
ESP89

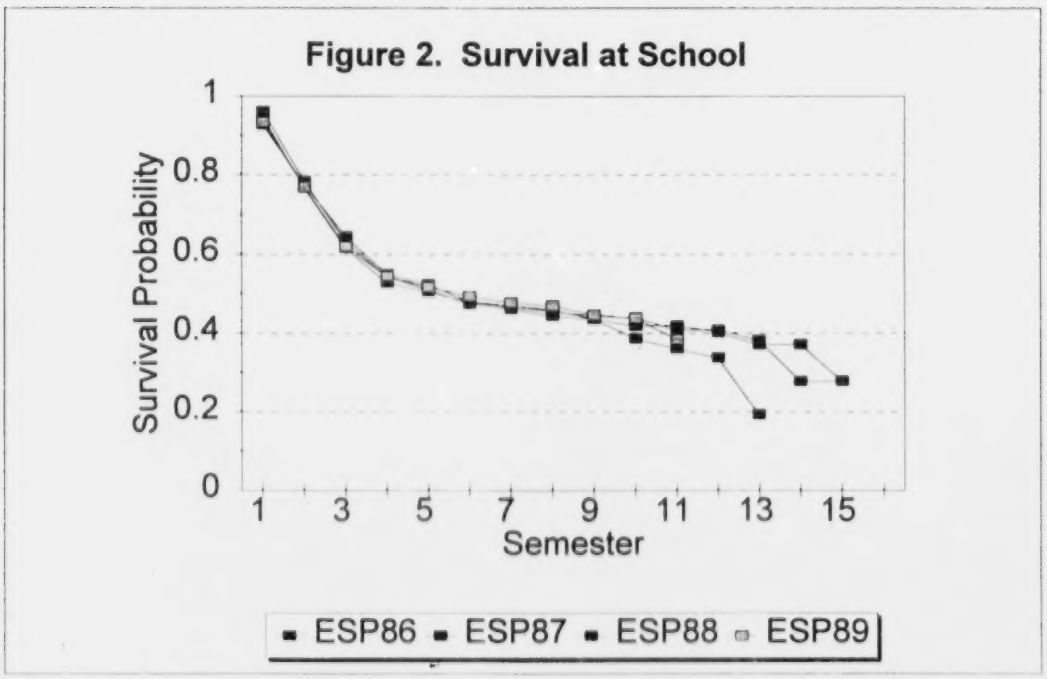
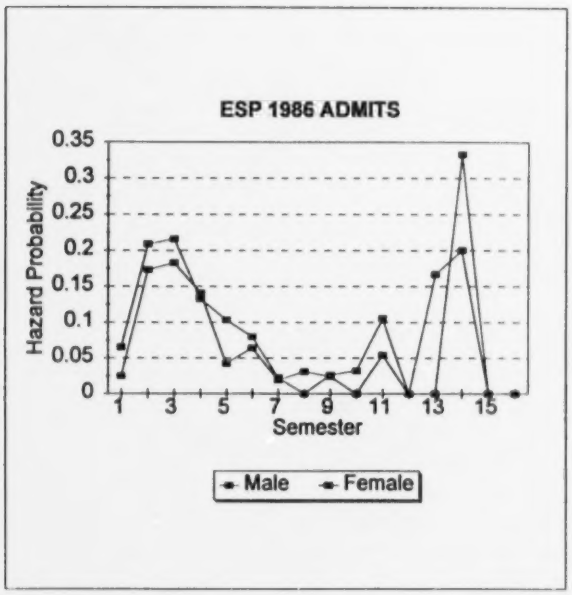
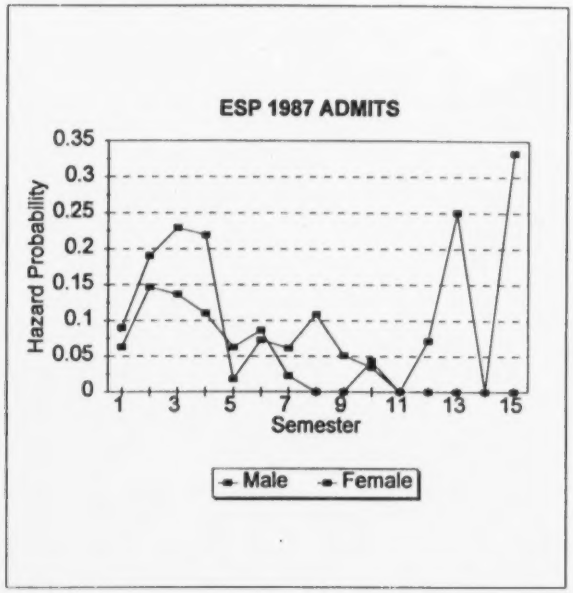
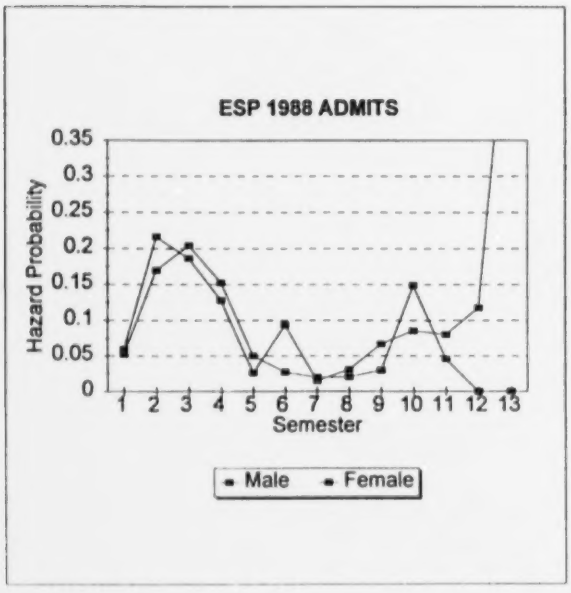


Figure 2. Survival at School
Survival Probability
1
0.8
0.6
0.4
0.2
0
1
3
5
7
9
11
13
15
Semester
ESP86
ESP87
ESP88
ESP89

Figure 3. Risk of Leaving School for Gender







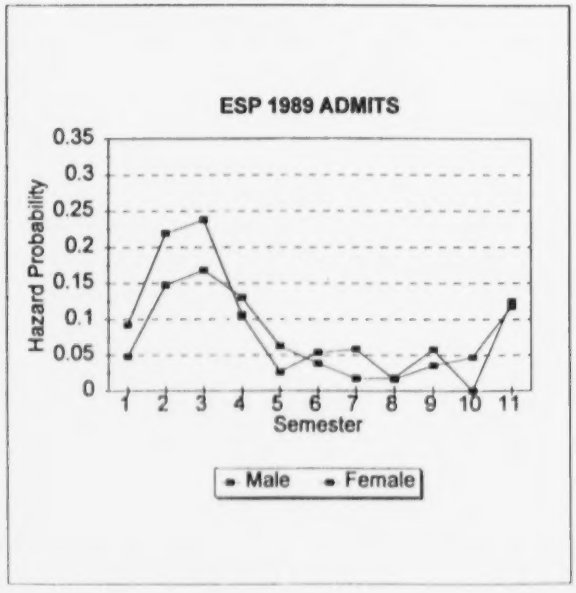


Figure 4. Risk of Leaving School for Race

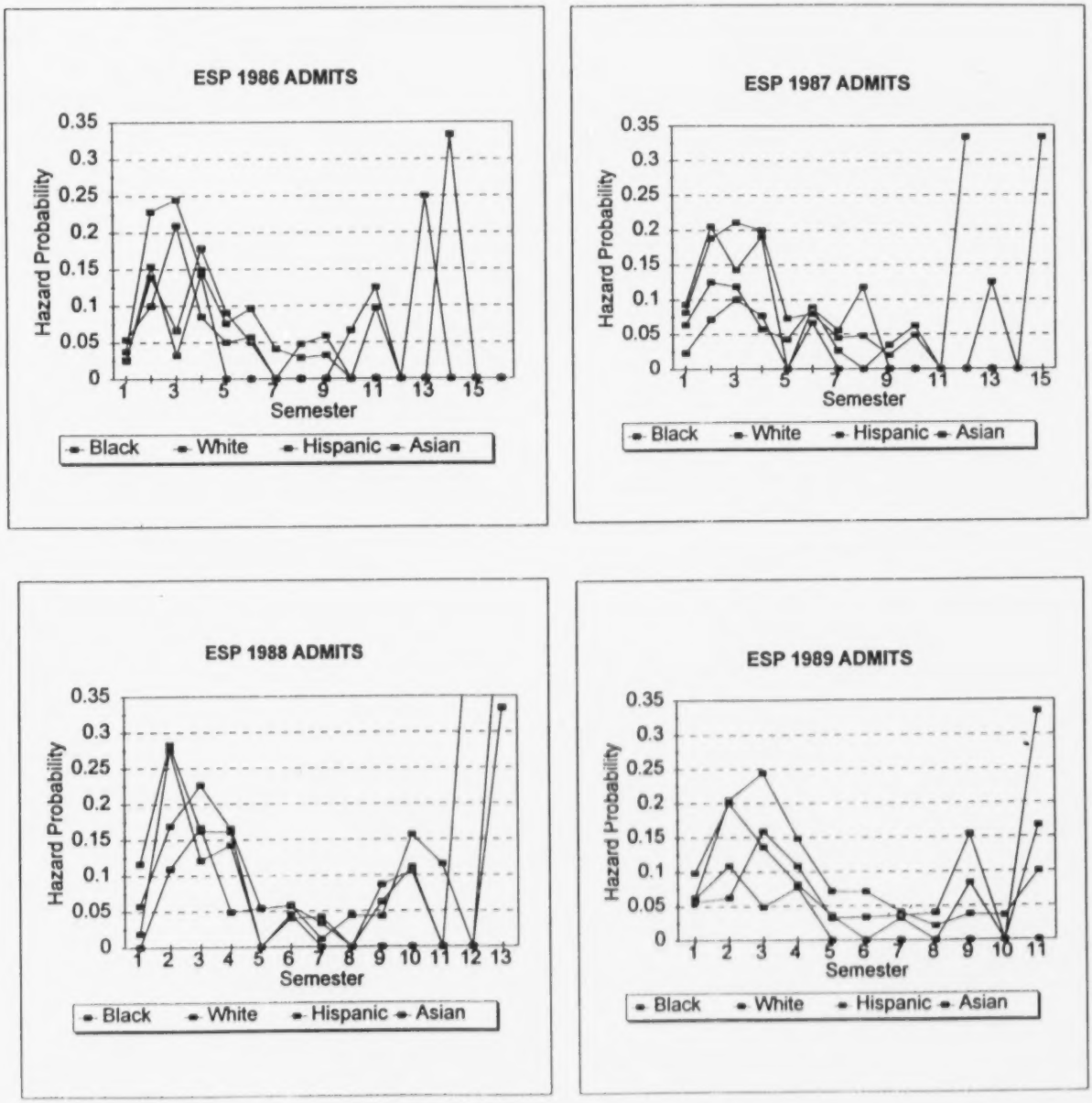
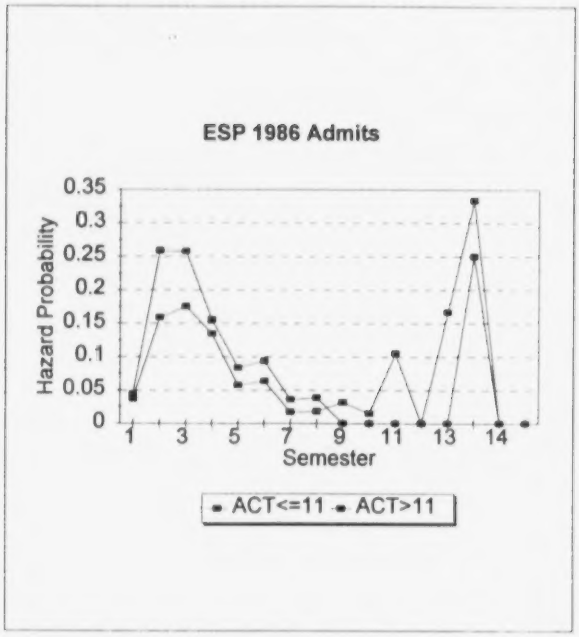
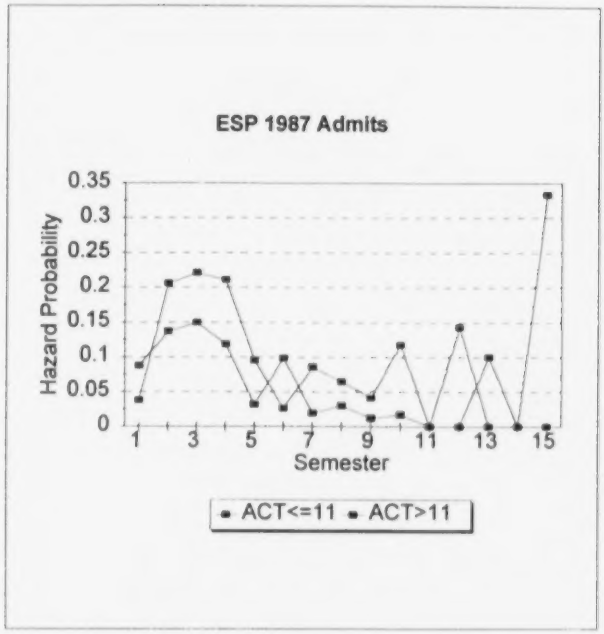
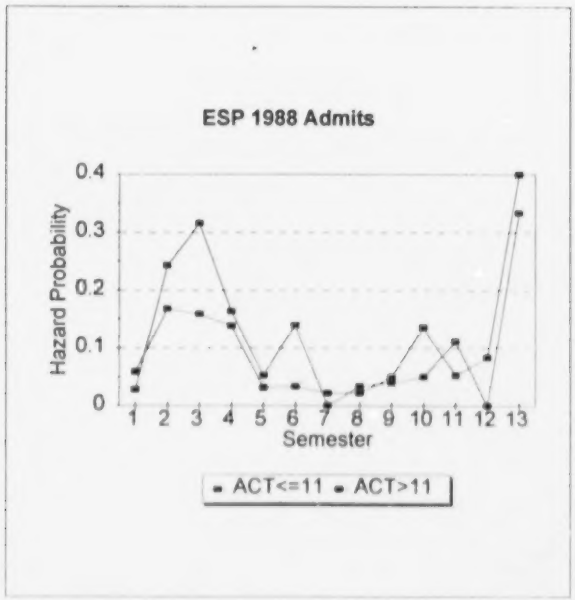


Figure 5. Risk of Leaving School for ACT Groups







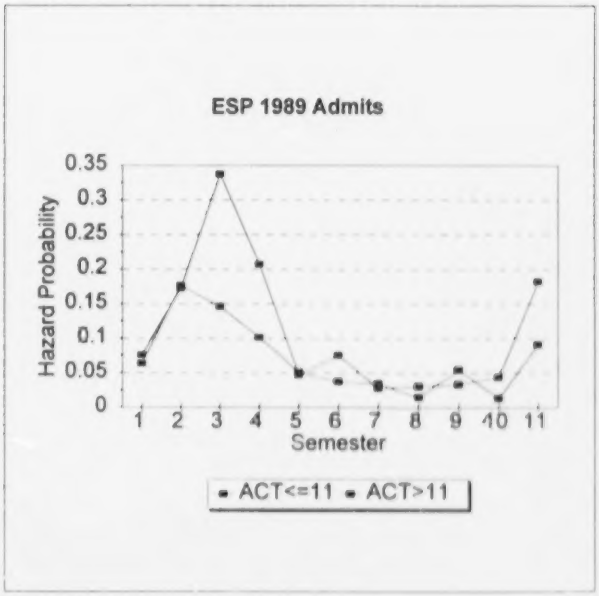
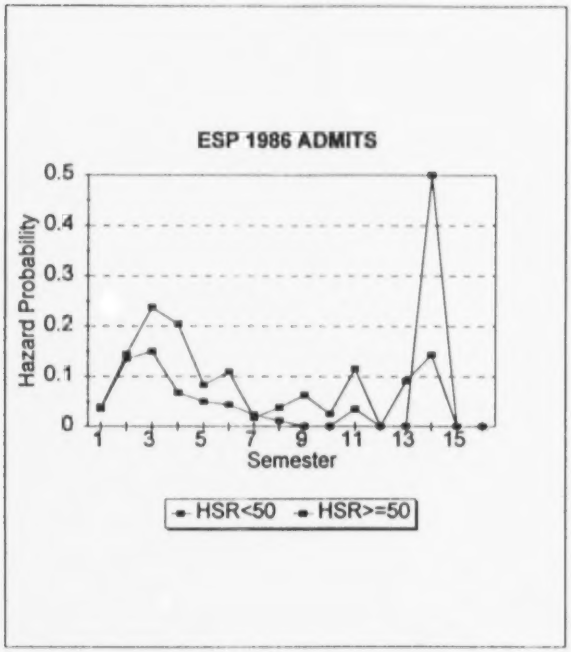
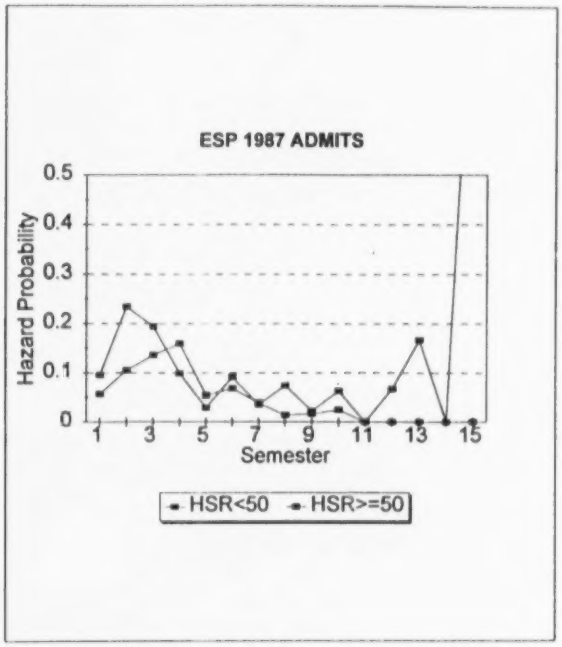
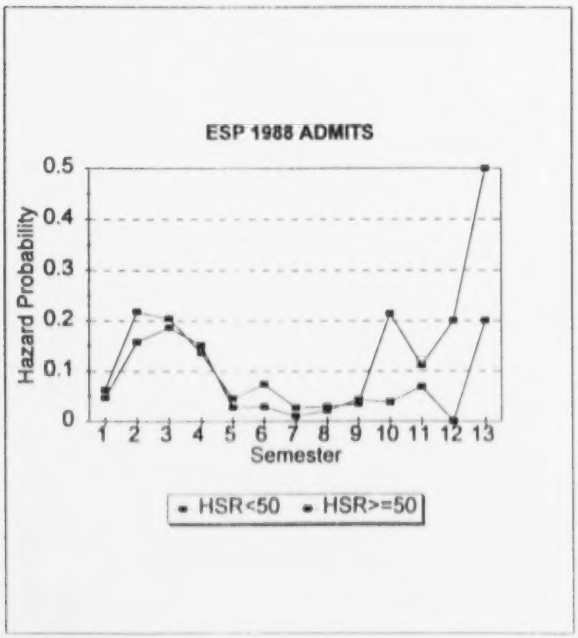
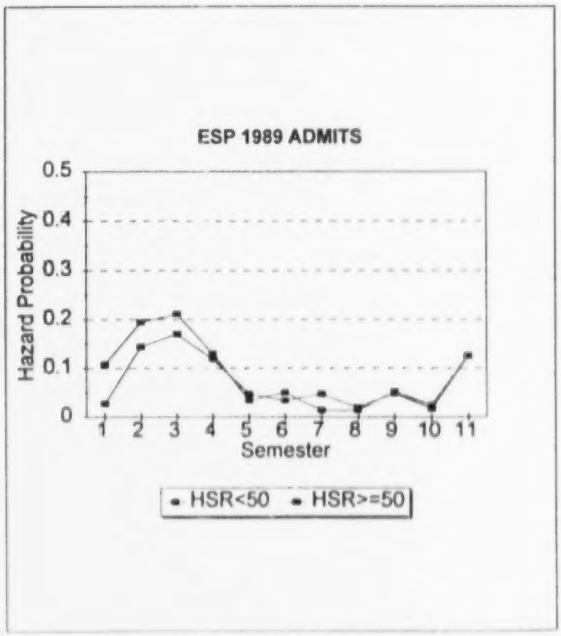


Figure 6. Risk of Leaving School for High School Rank Groups









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